

Arch 463
ECS
Fall 2001

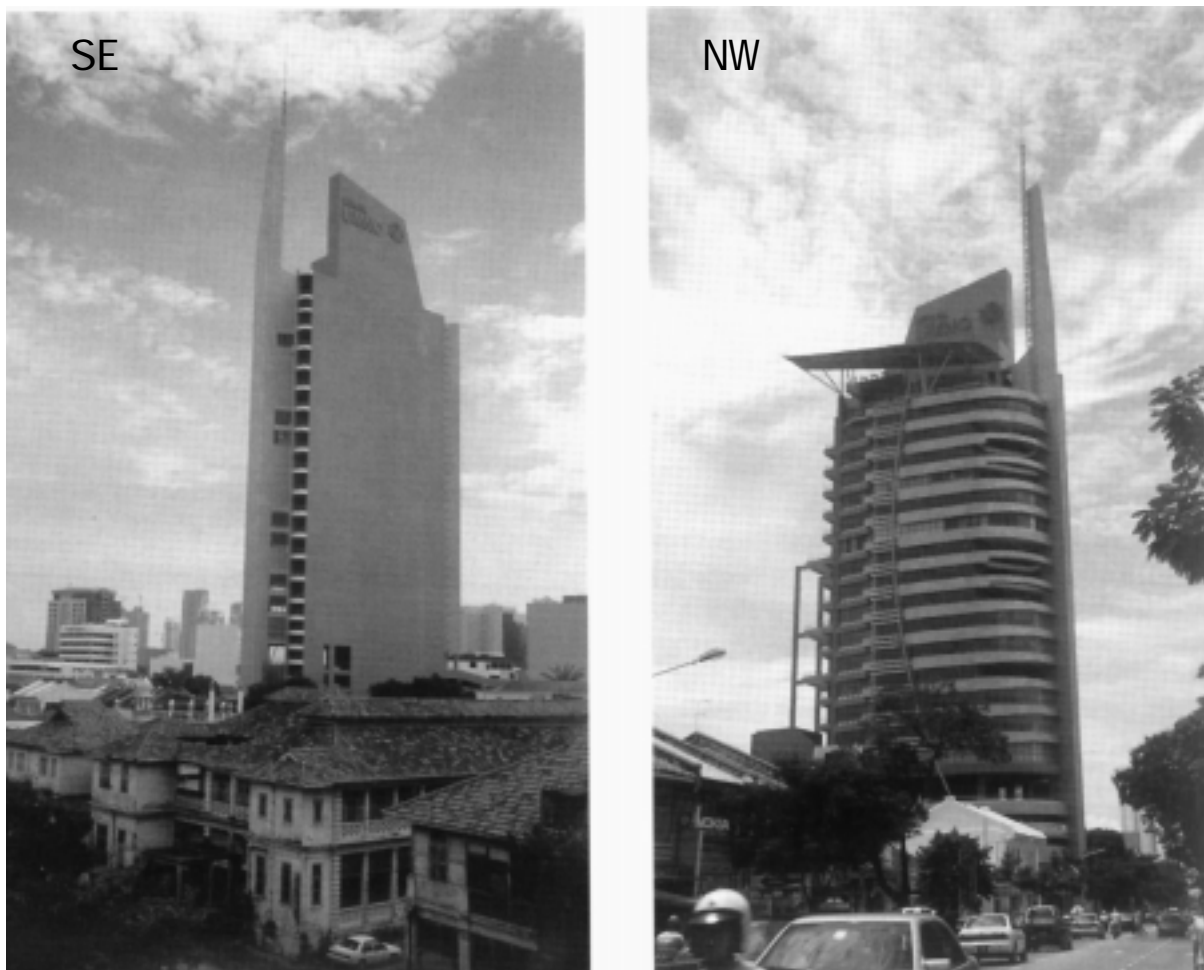
Name _____

Quiz #4

"Tropical and Passive"

For this problem you are the architectural technology critic for *The New York Times*. A recent 21-story building by Ken Yeang in Penang, Malaysia, was designed to be naturally ventilated. "We designed it as a non-air conditioned building because in Penang at that time the rentals were so low, that if you put up an air conditioned building, you would not get sufficient return." Yeang's work has been on the leading edge of sustainable architecture. "Simply stated, we seek in our design work a directed contribution towards a sustainable ecological future."

Georgetown, Penang is located at 5° NL and near sea level. It's climate is warm and humid all year long with temperatures ranging from 23°C to 32°C. Yeang says, "To approach thermal comfort conditions, significant air movement is essential to achieve sufficient heat transfer from the skin of the occupants to compensate for convection and radiation." Prevailing winds are from the south-west and the north, northeast year-round.

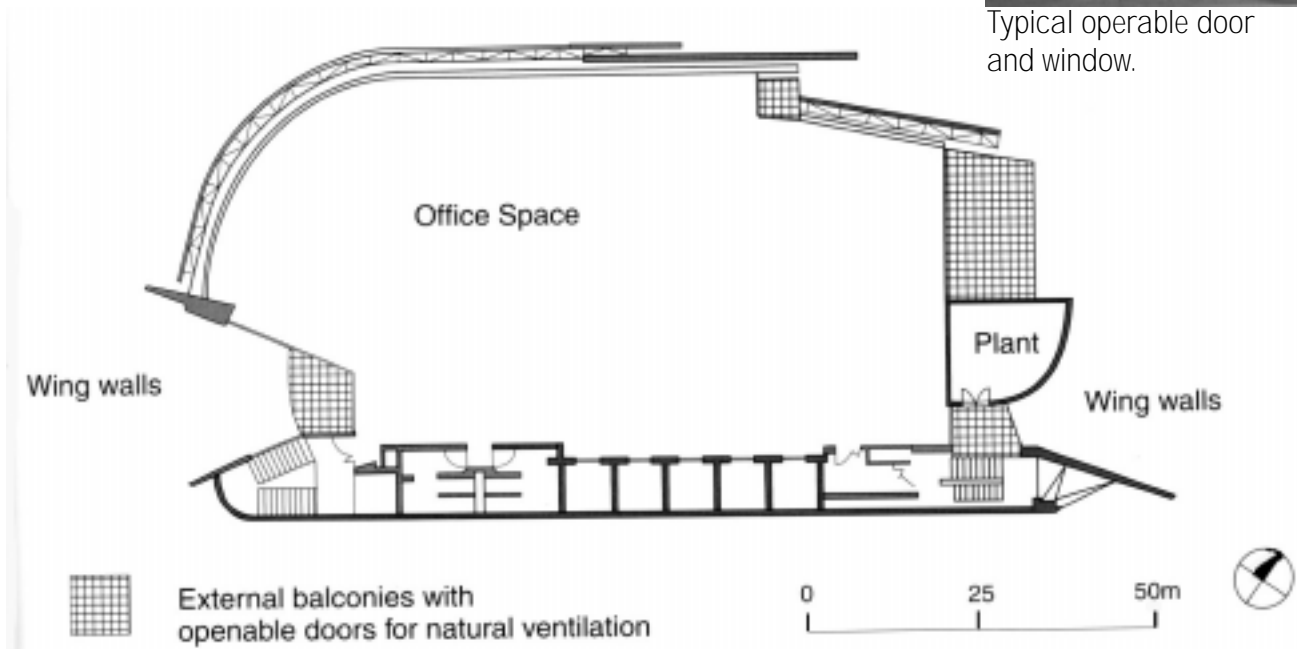


The Southeast and Northwest elevations of Menara UMNO tower in Georgetown, Penang, Malaysia.

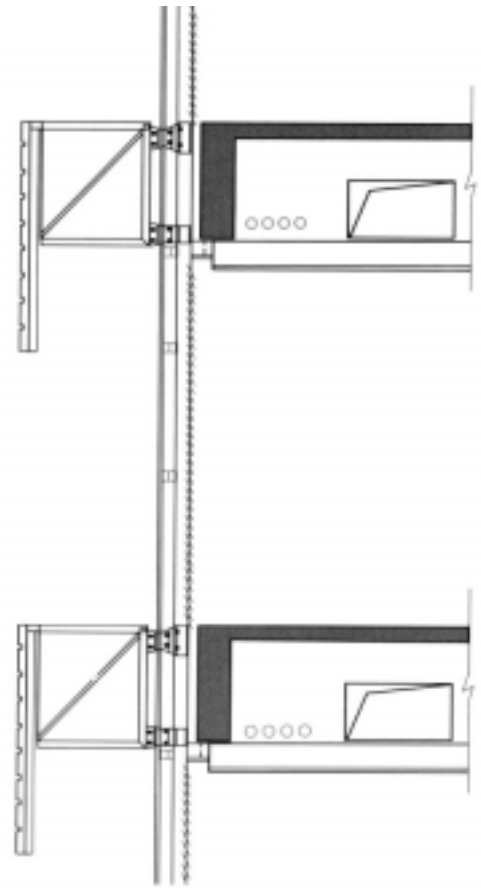
4 pts 1. The office floor plans use wing walls to funnel the prevailing winds to the operable doors and windows. **Show** how the natural ventilation works in the plan below. **Critique** the ventilation aperture design. **Suggest** an alternative configuration, **sketch** it, and **explain** why your design is better.



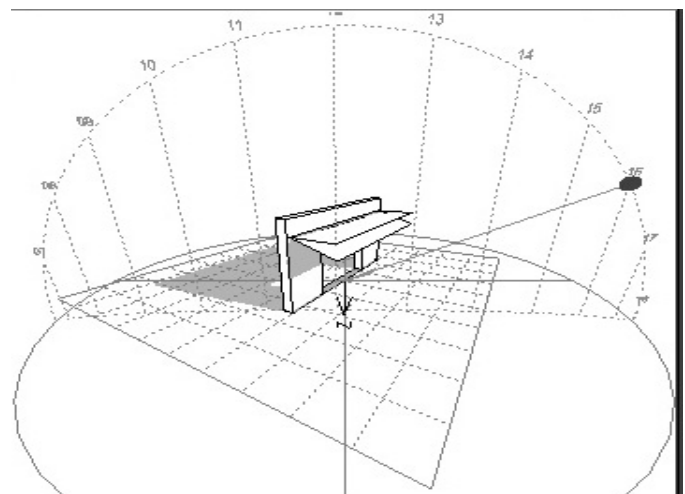
Typical operable door and window.



3 pts 2. The northwest facade features exterior and interior shading devices as well as double pane low-e glazing. **Critique** the design. **Design** an improved shading scheme. **Explain** why your design is better. (See page 5 for the Penang sun path diagram.)



Shading and glazing detail for a typical office floor. Floor to ceiling height is 3 meters, overhang is 1 meter, droop is 0.8 meters.

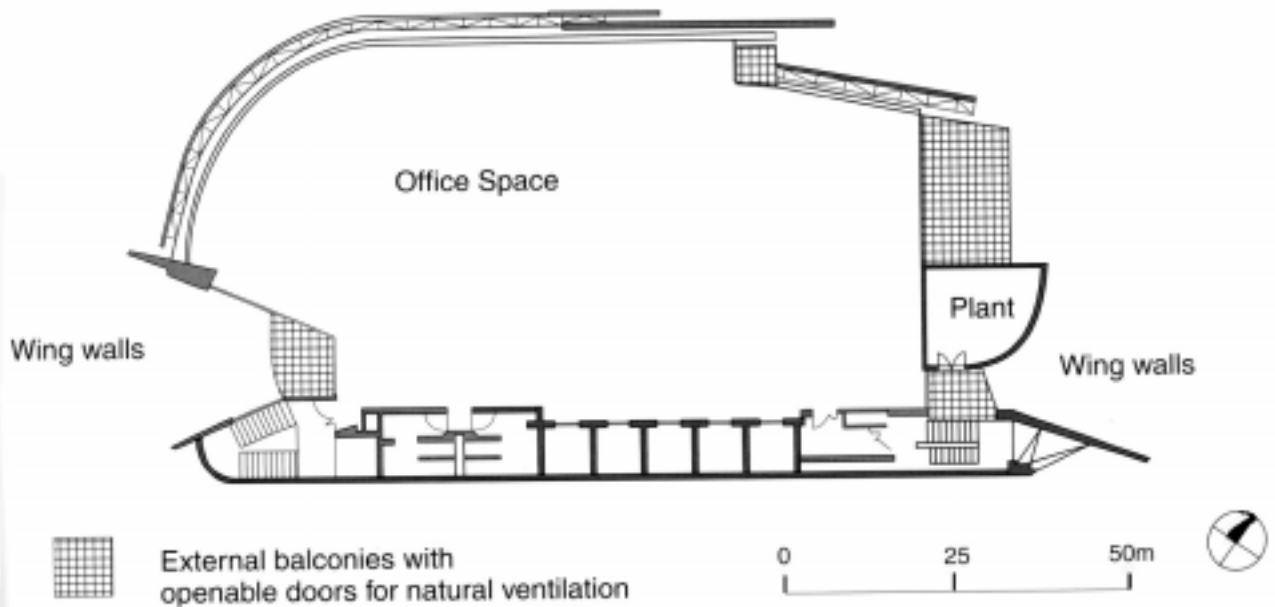


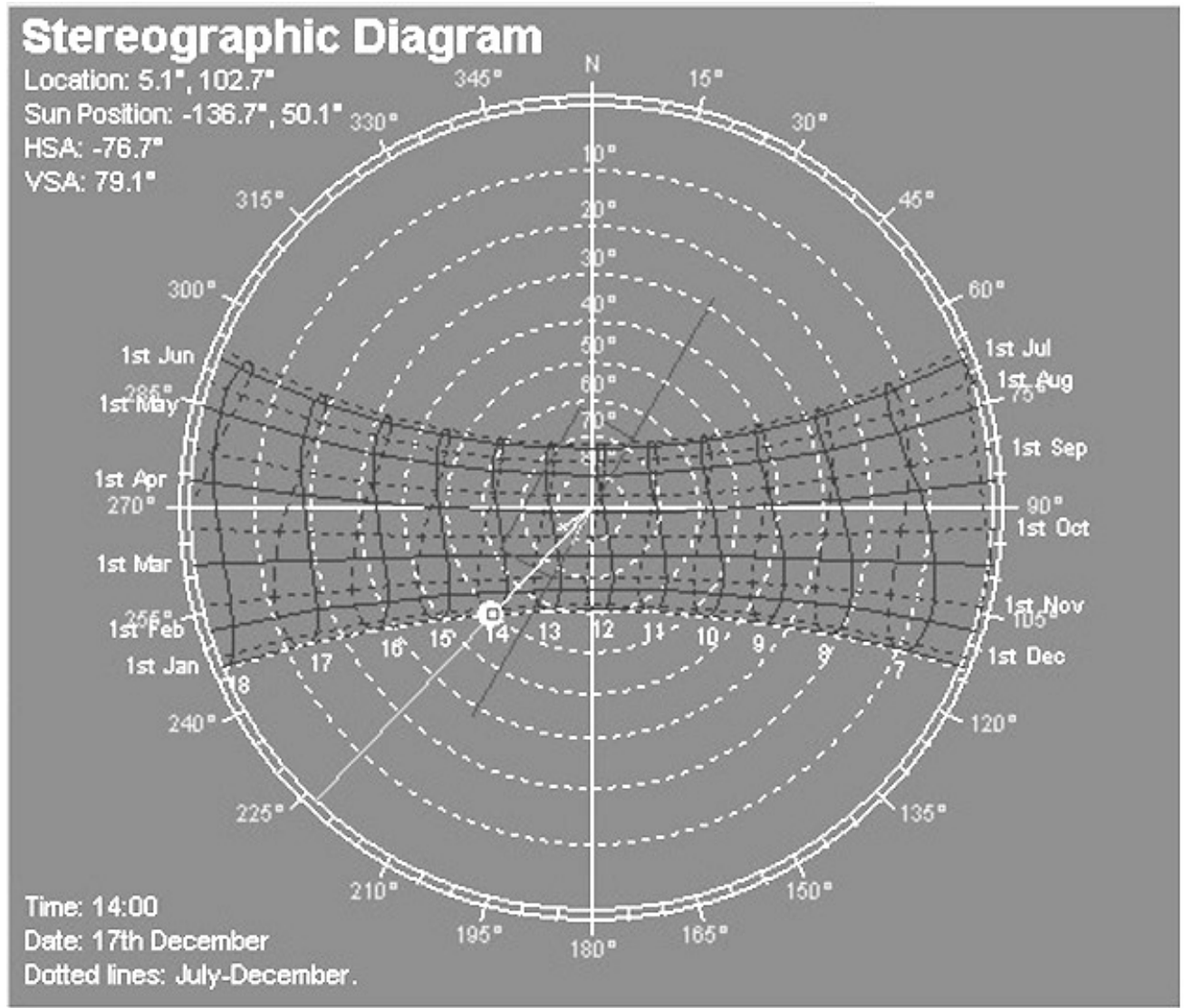
Suntool simulation of the NW-facing exterior shading device for 4pm on June 21.

3 pts
 3. During design development the developer changed his mind and asked Yeang to add air conditioning to each floor. The air handling units for the system are housed in the plant room on the northeast facade. **Name** an appropriate HVAC system for the building. On the plan below **show** the thermal zones for a typical floor. **Diagram and label** the thermostat locations and supply ducts. **Explain** the zoning and conditioned air supply schemes.



Air handling unit plant rooms viewed from the north.





Sun path for 5° NL—June at top, December at bottom.